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Dated: July 6, 2009 Signature: / Thomas W. Humphrey /
(Thomas W. Humphrey)

Docket No.: OPTO 11
(PATENT)

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Patent Application of:
Robert A. Kruger

Application No.: 10/672,137 Confirmation No.: 6106

Filed: September 26, 2003 Art Unit 3737

For: TISSUE SCANNER Examiner: John Fernando Ramirez

APPEAL BRIEF

MS Appeal Brief - Patents
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

As required under § 41.37(a), this brief is filed to accompany the Notice of Appeal filed in this case on March 4, 2009, and is in furtherance of said Notice of Appeal. The fees required under § 41.20(b)(2) are dealt with in EFS WEB TRANSMITTAL.

This brief contains items under the following headings as required by 37 C.F.R. § 41.37 and M.P.E.P. § 1205.2:

I. REAL PARTY IN INTEREST

The real party in interest for this appeal is:

Optosonics, Inc.

II. RELATED APPEALS AND INTERFERENCES

There are no other appeals, interferences, or judicial proceedings which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

III. STATUS OF CLAIMS

A. Total Number of Claims in Application

There are 12 claims pending in application.

B. Current Status of Claims

1. Claims canceled: 1-9
2. Claims withdrawn from consideration but not canceled: NONE
3. Claims pending: 10-22
4. Claims allowed: NONE
5. Claims rejected: 10-22

C. Claims On Appeal

The claims on appeal are claims 10-22.

IV. STATUS OF AMENDMENTS

Applicant did not file an Amendment After Final Rejection.

V. SUMMARY OF CLAIMED SUBJECT MATTER

Independent Claim 10 is described in the specification beginning at page 10, line 14, and Fig. 7 of the drawings. The claim recites an imaging system comprising a detector array L538, an acoustic receiver (DAS) coupled to the detector array for receiving acoustic signals detected in response to radiant energy delivered to the tissue, an ultrasound receiver (Acuson 128 XP) coupled to the detector array for receiving echoes from an ultrasonic beam, and an ultrasound beam steering circuit (Acuson 128 XP) coupled to the detector array for causing the array to generate an ultrasonic beam. Furthermore, the system includes an image reconstructor (Host Computer) coupled to the acoustic receiver for performing a backprojection algorithm to generate a representation of acoustic signals generated at points within the tissue. In the image reconstructor the representation for a point is based upon signals from plural detectors in the detector array (cross referenced US Patent 5,713,356 at page 2, line 18.

Independent Claim 16 is described in the specification beginning at page 10, line 14, and Fig. 7 of the drawings. The claim recites a method of using an imaging system comprising coupling a transducer array L538 to tissue, receiving, with the transducer array, thermoacoustically generated acoustic signals originated within the tissue in response to radiant energy delivered to the tissue, performing (within Host Computer) a backprojection algorithm to generate a representation of acoustic signals generated at points within the tissue. The representation for a point is generated from signals from plural transducers in the transducer array (cross referenced from US Patent 5,713,356). The method further includes delivering a steered beam of ultrasound into the tissue and receiving echoes of the beam with the transducer

array L538 and an ultrasound receiver (DAS), and generating an image of the tissue from thermoacoustically generated signals and the ultrasound beam.

VI. GROUNDS OF REJECTION TO BE REVIEWED ON APPEAL

Claims 10-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Wang (US 6,567,688) in view of Kuhn et al. (US 5,339,282).

VII. ARGUMENT

The Examiner's obviousness rejection based upon Wang U.S. Patent 6,567,688 is based upon the Examiner assertion that Wang discloses a system that can be used to obtain ultrasonogram images and thermoacoustic images sequentially, referencing the text bridging cols. 14 and 15 of the Wang patent.

Applicant initially notes that the Wang patent specification primarily discloses a system that utilizes an mechanically scanned array of focused transducer elements: two- or three-dimensional images are created from the assembly of one dimensional lines of data, in which each pixel is generated from the output of a single focused transducer. See, e.g., Wang's abstract: "[e]ach time-domain signal from the ultrasonic transducer is converted to a one-dimensional image along the acoustic axis of the ultrasonic transducer. Scanning the system perpendicularly to the acoustic axis of the ultrasonic transducer generates multi-dimensional images in real time without computational image reconstruction." [emphasis added]

As Wang is limited to the use of conversion of one dimensional images along an acoustic axis, the Wang patent does not disclose the use of backprojection methods to capture thermoacoustic images. Indeed, the discussion cited by the Examiner in the text bridging cols. 14-15 specifically states that an image is created with focused transducer, in lines ("[b]oth images measure the same line defined by the ultrasonic axis"). As is clarified in col. 15 at lines

17-19, a "time-domain echo signal [is] converted into a one-dimensional image along the acoustic axis."

There is a discussion in Wang of the use of unfocused ultrasonic tranducers, e.g. at col. 2 line 49, 6 lines 37-57, and claims 28 and 39. However, the text refers to the use of synthetic aperture, not backprojection, to monitor echo signals, i.e., without a backprojection.

Turning now to a comparison with the present invention, the present specification notes (page 6, lines 16 et seq.) that "[p]hotoacoustic images were reconstructed using a filtered-backprojection algorithm described in the above-referenced U.S. Patents. [See page 1, line 12] To implement this algorithm, the first derivative of the recorded photoacoustic signals for each transducer element and each angle were back-projected over circular arcs centered at each transducer element's location. .... Two-dimensional images were reconstructed on a 256 x 256 grid of 0.1-mm pixels." For ultrasound imaging, conventional ultrasound methods are used, via the "Acuson 128 XP ultrasound imaging system" (see Fig. 7, "128 XP"). The referenced system utilizes phased beam steering techniques to produce a focused beam along a linear path from an array of ultrasonic transducers.

The claims at issue herein, each requires "a backprojection algorithm to generate a representation of acoustic signals generated at points within the tissue, the representation for a point being based upon signals from plural detectors in said detector array", and at the same time, states that ultrasound imaging is generated by "beam steering". These two uses for the transducers are recited within the claims, whereas Wang does not teach "backprojection" and in fact teaches away from the use of computational methods for recontruction, by showing a focused transducer or an array of transducers that are used together as a synthetic aperture – in either case creating a line of data rather than a reconstruction by backprojection that would involve the use of plural measured signals to reconstruct a pixlel.

In view of the lack of "backprojection" in the cited Wang patent and the lack of any suggestion to combining backprojection with beam steering on an imaging system, Applicant submits that all claims herein are allowable.

VIII. CLAIMS

A copy of the claims involved in the present appeal is attached hereto as Appendix A. As indicated above, the claims in Appendix A include the amendments filed by Applicant on November 4, 2008.

Applicant believes a two month extension of time fee is due with this response. This fee should be included with the EFS transmittal of this brief. However, if a fee is due, please charge our Deposit Account No. 23-3000, under Order No. OPTO-11 from which the undersigned is authorized to draw.

Dated: July 6, 2009

Respectfully submitted,

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APPENDIX A

Claims Involved in the Appeal of Application Serial No. 10/672,137

1. - 9. (cancelled)

10. (previously presented) An imaging system for imaging structures of tissue, comprising:

a detector array;

an acoustic receiver coupled to said detector array for receiving acoustic signals generated in response to radiant energy delivered to said tissue and detected by said detector array;

an image reconstructor coupled to said acoustic receiver for performing a backprojection algorithm to generate a representation of acoustic signals generated at points within the tissue, the representation for a point being based upon signals from plural detectors in said detector array;

an ultrasound receiver coupled to said detector array for receiving echoes from an ultrasonic beam delivered into said tissue; and

an ultrasound beam steering circuit coupled to said detector array for causing said array to generate said ultrasonic beam.

11. (previously presented) The imaging system of claim 10 further comprising a TACT processing system incorporating said image reconstructor for producing TACT images using

acoustic signals detected by the said detector array, said TACT receiver coupled to said TACT processing system.

12. (previously presented) The imaging system of claim 10 further comprising an ultrasound imaging system, said ultrasound receiver coupled to said ultrasound imaging system.

13. (previously presented) The imaging system of claim 10 wherein said ultrasound beam steering circuit is coupled to and controlled by an ultrasound imaging system.

14. (previously presented) The imaging system of claim 11, wherein said TACT processing system sends images to a display.

15. (previously presented) The imaging system of claim 12, where in said ultrasound imaging system sends images to a display.

16. (previously presented) A method for using an imaging system for imaging structures of tissue, comprising:

coupling a transducer array to said tissue;

receiving, with said transducer array, thermoacoustically acoustic signals originated within said tissue in response to radiant energy delivered to said tissue;

performing a backprojection algorithm to generate a representation of acoustic signals generated at points within the tissue, the representation for a point being generated from signals from plural transducers in said transducer array;

delivering a steered beam of ultrasound into said tissue;

receiving echoes of said ultrasound beam with said transducer array and an ultrasound receiver; and

generating an image of said tissue from one or both of said thermoacoustically generated signals and said echoes of said ultrasound beam.

17. (previously presented) The method of claim 16, wherein an image of the tissue is created from said echoes and an image of the tissue is created from said representation generated from said thermoacoustically generated signals, and said images are presented on display overlaid in spacial registration or in comparison with each other.

18. (previously presented) The method of claim 16, wherein said thermoacoustically generated signals are delivered to a TACT processing system for producing TACT images using acoustic signals detected by the said detector array.

19. (previously presented) The method of claim 16, wherein said ultrasound echoes are sent to an ultrasound imaging system.

20. (previously presented) The method of claim 16, wherein said ultrasound beam is generated using steering delays controlled by an ultrasound imaging system.

21. (previously presented) The method of claim 18, wherein said TACT processing system sends images to a display.

22. (previously presented) The method of claim 19, wherein said ultrasound imaging system sends images to a display.

APPENDIX **B**

No evidence pursuant to §§ 1.130, 1.131, or 1.132 or entered by or relied upon by the examiner is being submitted.

APPENDIX C

No related proceedings are referenced in II. above, hence copies of decisions in related proceedings are not provided.